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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,469	11/28/2003	Cha Jae Jo	2708-104	7979

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EXAMINER

ALEXANDER, MICHAEL P

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 12/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/722,469	<b>Applicant(s)</b> JO ET AL.	
	<b>Examiner</b> Michael P. Alexander	<b>Art Unit</b> 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 11-13 and 19-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 14-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>29 March 2004</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Claims 1-23 are pending.

#### ***Election/Restrictions***

Applicant's election Group I in the reply filed on 27 October 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 11-13 and 19-23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 27 October 2005.

#### ***Information Disclosure Statement***

US 5,449,411 does not have AMOR et al. as the inventors and was clearly included on the IDS form in error.

#### ***Claim Objections***

Claim 1 is objected to because of the following informalities: "containing a electrolytic polishing solution" in lines 8-9 should be "containing **an** electrolytic polishing solution". Appropriate correction is required.

Claim 4 is objected to because of the following informalities: "a range of 2.0 to 3.5" should be changed to "a pH range of 2.0 to 3.5". Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akoshima et al. (JP 8-120499) in view of Nakaoka et al. (US 2004/0043242 A1), Yamaoka et al. (JP 62188785 A) and JP 51-025766 A.

Regarding claim 1, Akoshima et al. teach (0019-0020 and Fig. 3) a method for manufacturing a copper foil, the method comprising the steps of: providing a copper foil and electrolytic polishing the copper foil through electrolysis by applying a positive current to the copper foil and by applying a negative current to the cathode plate with dipping the copper foil to face a cathode plate within at least one electrolytic polishing bath installed with the cathode plate and containing a electrolytic polishing solution.

Still regarding claim 1, Akoshima et al. do not specify that the copper foil would be manufactured by electrodeposition and mechanical rolling, do not specify the step of

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pickling the copper foil within an acid pickling bath containing an acid solution and do not specify the step of washing the polished copper foil within a water washing bath containing water.

With respect to the limitation that the copper foil be manufactured by electrodeposition and mechanical rolling in claim 1, Nakaoka et al. teach (paragraph 0025) a method of manufacturing a copper foil by electrodeposition and mechanical rolling in order to create a copper foil having a smooth surface. It would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by manufacturing the copper foil by electrodeposition and mechanical rolling in order to create a copper foil having a smooth surface as taught by Nakaoka et al.

With respect to the step of pickling the copper foil within an acid pickling bath containing an acid solution in claim 1, Yamaoka et al. teach (see abstract) a method of pickling copper and copper alloys by pickling in an acid pickling bath containing an acid solution in order to remove the oxide film from the surface of the copper. It would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by pickling the copper surface by pickling in an acid pickling bath containing an acid solution in order to remove the oxide film from the surface of the copper as taught by Yamaoka et al.

With respect to the step of washing the polished copper foil within a water washing bath containing water in claim 1, JP 51025766 A teaches (see abstract) a method of treating a copper foil including the step of washing in water, inherently in a bath, the copper foil in order to remove residual ions from the previous treatment. It

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would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by washing the polished copper foil within a water washing bath containing water in order to remove residual ions from the polishing treatment as taught by JP 51025766 A.

With respect to the limitation that the copper foil would have very low roughness in claim 1, firstly the claim and the instant specification do not provide a standard for ascertaining the requisite degree of roughness. Secondly, the Examiners asserts that the copper foil produced by the electrolytic polishing process of Akoshima et al. in view of Nakaoka et al., Yamaoka et al. and JP 51-025766A would inherently have very low roughness as claimed because Akoshima et al. in view of Nakaoka et al., Yamaoka et al. and JP 51-025766A teach the substantially similar process as claimed as stated above.

Regarding claim 2, Akoshima et al. teach (0019) that the electrolytic polishing solution would include sulfuric acid.

Regarding claim 3, Akoshima et al. teach (0019) that the electrolytic polishing solution would include copper sulfate, which would be a corrosion inhibitor formed of sulfur compounds.

Regarding claim 4, the electrolytic solution of Akoshima et al. (0009) would inherently have an acidity within a range of 2.0 to 3.5 pH.

Regarding claim 5, Akoshima et al. teach (0009) that the electrolytic polishing step would be performed in a solution having a temperature of 50 degrees C.

Regarding claim 6, Akoshima et al. teach (0024) that the electrolytic polishing step would be performed at a current density of  $10 \text{ A/dm}^2$ .

Regarding claim 7, Akoshima et al. teach (0009) that the electrolytic polishing step would be performed at 1 to 30 seconds in the electrolytic polishing bath, which overlaps with the claimed range of 20 to 120 seconds. Overlapping ranges are prima facie evidence of obviousness. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art to select a time of polishing of 20-30 seconds from the range disclosed by Akoshima et al. because Akoshima et al. teach the same utility throughout the disclosed range.

Regarding claim 8, the Examiner asserts that laminar flow would inherently be present in the method of Akoshima et al. because Akoshima et al. does not suggest the presence of turbulent flow.

Regarding claim 9, Akoshima et al. teach (0023) that the electrolytic polishing step would be performed by installing the cathode plate to face a matt side of the copper foil having a relatively high roughness.

Regarding claim 10, Akoshima et al. teach (0023) that the electrolytic polishing step is performed by arranging alternately the electrolytic polishing bath having the cathode plate installed to face only the matt side of the copper foil and the electrolytic polishing bath having the cathode plate installed to face only the shiny side of the copper foil.

Regarding claim 18, Yamaoka et al. teach (abstract) that the pickling solution would include sulfuric acid and would inherently have a pH of less than 5.0.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akoshima et al. in view of Nakaoka et al., Yamaoka et al. and JP 51-025766 A as applied to claim 1 above, and further in view of SU479820A..

Regarding claim 14, Akoshima et al. teach (0023) that the method provides a plurality of electrolytic polishing solutions within a plurality of baths but do not specify that the temperature second bath would be lower than the temperature of the first bath. However, SU 479820A teaches (abstract) that decreasing the temperature decreases the rate of dissolution during electropolishing. It would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by decreasing the temperature of the second bath in order to decrease the rate of dissolution during electropolishing as taught by SU 479820A.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akoshima et al. in view of Nakaoka et al., Yamaoka et al. and JP 51-025766 A as applied to claim 1 above, and further in view of Shieh et al. (US 2003/0221974 A1).

Regarding claim 15, Akoshima et al. teach (0023) that the method provides a plurality of electrolytic polishing solutions within a plurality of baths but do not specify that the pH second bath would be lower than the temperature of the first bath. However, Shieh et al. teach (0024) that decreasing the pH value of an electropolishing bath increases the electropolishing rate of the electrolytic solution. It would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by decreasing the pH value of the second bath in order to increase the electropolishing rate during the electropolishing as taught by Shieh et al.



Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akoshima et al. in view of Nakaoka et al., Yamaoka et al. and JP 51-025766 A as applied to claim 1 above, and further in view of Liu et al. (US 2003/0178320 A1).

Regarding claim 16, Akoshima et al. teach (0023) that the method provides a plurality of electrolytic polishing solutions within a plurality of baths but do not specify that the second bath would have a higher concentration of the copper sulfate corrosion inhibitor. However, Lui et al. teach (0065) that increasing the amount of corrosion inhibitor with decrease the removal rates during an electropolishing process. It would have been obvious to one of ordinary skill in the art to modify the method of Akoshima et al. by increasing the amount of the copper sulfate corrosion inhibitor in order to decrease the removal rates during the electropolishing process as taught by Liu et al.

Regarding claim 17, see the rejection of claim 3.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael P. Alexander whose telephone number is 571-272-8558. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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